

Lecture Module - Introduction

ME3023 - Measurements in Mechanical Systems

Mechanical Engineering

Tennessee Technological University

Topic 1 - Introduction

Module 1 - Introduction

- Topic 1 - General Measurement System
- Topic 2 - Types of Variables
- Topic 3 - Experimental Test Plan
- Topic 4 - Numbers and Storage

Topic 1 - General Measurement System

- Definition of a Measurement
- Measurement System Stages
- Brainstorming Activity
- Examples in Mechanical Engineering

Definition of a Measurement

“A **measurement** is an act of assigning a specific value to a physical variable.”

Text: Theory and Design of Mech. Meas.

Measurement System Stages

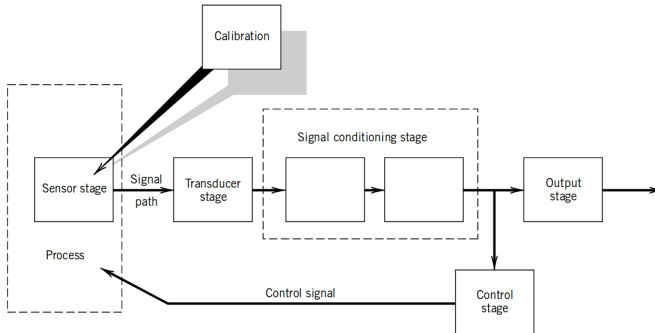
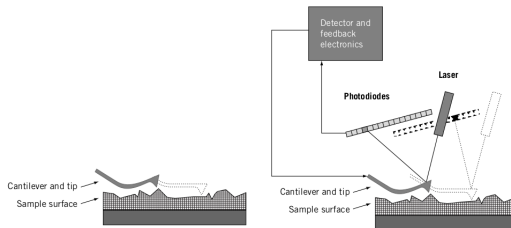


Figure 1.5 Components of a general measurement system.

Image: Theory and Design of Mech. Meas.

Sensor-Transducer Stage

a **sensor**, a physical element that employs some natural phenomenon... ..to sense the variable being measured

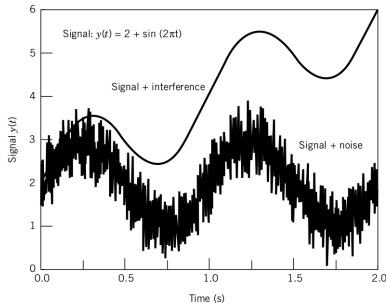


A **transducer** converts the sensed information into a detectable signal

Text, Image: Theory and Design of Mech. Meas.

Signal Conditioning Stage

What is the the definition of **signal**?



- Filtering
- Amplification
- Attenuation
- Excitation
- Linearization
- Electrical Isolation
- Surge Protection

Image: Theory and Design of Mech. Meas.

Output Stage

The **output stage** indicates or records the value measured. This might be a simple readout display, a marked scale, or even a recording device such as a computer disk drive.

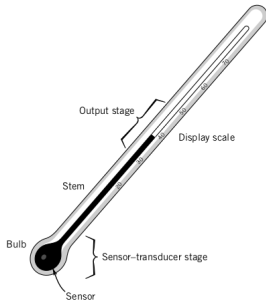


Image: Theory and Design of Mech. Meas.

Image: [Wikipedia](#)

Numbers and Storage

Activity: Team Brainstorm
Duration: ~ 10 minutes
Groups: 2-3 members



Topic: Remote Probe Concept

- You are designing a remote probe to inspect an environment which can only be accessed from above.
- The goal is to collect as much information as possible from the environment to prepare for a robotic maintenance task.

Requirements:

- Probe must enter environment through hole ~ 100mm wide
- Probe must exit through same hole leaving nothing behind
- The allowable EMI and RFI is limited. No wifi communication is available

Numbers and Storage

IDETC2022-96785: Development of an Instrumented Rear Suspension to Measure the Tire Forces of a Race Car During Track Driving



Numbers and Storage

IDETC2022-91154: Photometric Stereo Enhanced Light Sectioning
Measurement for Microtexture Road Profiling



Numbers and Storage

IDETC2022-90082: Automated Weld Path Generation Using
Random Sample Consensus and Iterative Closest Point Workpiece
Localization



Types of Variables

Numbers and Storage

Numbers and Storage